interest, makes a very unsuitable course of reading for the student. But for those who are seeking specially full information on any of the subjects dealt with, this work will prove a very useful aid.

The introductory chapters deal very concisely with interpolation formulæ, the chief developments in series, and the method of least squares (without any account of the error-function). A long chapter deals with the theory of the earth's rotation. This part is rather hard reading, owing to the great number of symbols introduced. It would, we think, have been worth while to set out the definition of each symbol on a separate line, in order that it might be more readily referred to; for the reader can scarcely carry in his head the meaning of all the symbols, and their definitions are scattered through a great many pages of the text. Another long chapter deals with refraction, and includes a discussion of the effect of water-vapour on the constant of refraction. The treatment of the great problems of fundamental astronomy, the determination of the equinox, the obliquity of the ecliptic, and the construction of a fundamental catalogue is most thorough and satisfactory. In the chapter on parallax it may be noted that the correction to the ellipticity of the earth is included as an unknown in the determination of the moon's parallax; this small illustration shows the author's practical acquaintance with his subject, for the two quantities are so closely related that it is not improbable that the best determination of the figure of the earth may ultimately be obtained from lunar observations.

We would strongly criticise the absence of all reference to the theory of photographic observations. Thus, whilst the effect of precession, parallax, aberration, and refraction on micrometer measures is fully discussed, the formulæ relating to their effect on photographic measures are ignored. The theory of the projection of the celestial sphere on a photographic plate is eminently a branch of spherical astronomy, and at the present day it is most constantly required by practical astronomers, yet the text-books persist in devoting their whole attention to the obsolescent position angle and distance, instead of to rectangular coordinates. Such an omission is misleading to the student, and it is a defect in a work of reference for the observatory. Much of geometrical astronomy consists in a perfunctory application of three formulæ of spherical trigonometry; but the theory of rectangular coordinates is a more difficult subject, and the observer could not generally work out for himself the necessary formulæ without guidance.

A. S. E.

## *RECENT BOTANICAL PUBLICATIONS.*

(1) *An Introduction to Plant Geography.* By Dr. M. E. Hardy. Pp. 192+66 figures. (Oxford: Clarendon Press, 1913.) Price 2*s.* 6*d.*

(2) *The Living Plant: A Description and Interpretation of Its Functions and Structure.* By Prof. W. F. Ganong. Pp. xii+478+178 figures. (London: Constable and Co., Ltd.; New York: Henry Holt and Co., 1913.) Price 15*s.* net.

(3) *Flowerless Plants: How and Where they Grow.* By S. Leonard Bastin. Pp. xi+152+64 plates. (London Cassell and Co., Ltd., 1913.) Price 6*s.* net.

(4) *School and Home Gardens.* By W. H. D. Meier. Pp. iv+319+159 figures. (Boston and London: Ginn and Co., n.d.) Price 4*s.*

(5) *Agronomy: A Course in Practical Gardening for High Schools.* By W. N. Clute. Pp. xvi+296+195 figures. (Boston and London. Ginn and Co., n.d.) Price 4*s.* 6*d.*

(6) *Das botanische Praktikum.* Fünfte Auflage. By the late Dr. E. Strasburger and Dr. M. Koernicke. Pp. xxvi+860+246 figures. (Jena: Gustav Fischer, 1913.) Price 24 marks.

(7) *Paläobotanisches Praktikum.* By Prof. H. Potonié and Dr. W. Gothan. Pp. viii+152+14 figures. (Berlin: Gebrüder Borntraeger, 1913.) Price 4 marks.

(8) *Die palaeobotanische Literatur.* By W. J. Jongmans. Dritter Band: Die Erscheinungen der Jahre 1910 und 1911 und Nachträge für 1909. Pp. 569. (Jena: Gustav Fischer, 1913.) Price 26 marks.

(9) *Icones of the Plants of Formosa, and Materials for a Flora of the Island, based on a Study of the Collections of the Botanical Survey of the Government of Formosa.* By B. Hayata. Fasc. ii. Pp. 156+40 plates. (Taihoku: Bureau of Productive Industries, 1912.)

(1) THE compiler of this introduction to plant geography appears to be somewhat out of touch with the modern development of the subject from the ecological point of view. The work is apparently intended for school use, but one would have thought that the best method of approach would be to deal at some length with the conditions of plant life in general, instead of devoting to this subject only twenty pages towards the end of the book as the author has done, and to lay stress on the idea of plant communities rather than to plunge, after a brief glance at a few types of British vegetation, into the descriptions of the "main vegetations of the globe," which form the greater part of the book. However, these descriptions, though extremely condensed, are thoroughly readable and vivid, but it is very doubtful whether the author's method of

treatment is calculated to give the subject of plant geography much educational value in a school curriculum. Many of the illustrations are extremely poor. However, we may perhaps hope for a more adequate and better illustrated treatment of the subject in the more advanced book promised in the preface.

(2) Prof. Ganong has already laid students and teachers of botany under a debt of gratitude for his valuable and helpful manuals, and in the present work he has produced an attractive and stimulating volume which every botanical teacher would do well to obtain. It presents the clearest and most complete picture of plant life that has appeared for many years, and should do much to popularise the study of plants among that increasing class of readers whose needs are met neither by the standard text-books intended primarily for college students, nor by the unfortunately too common type of "popular" botany book the appeal of which is made by means of coloured plates with incidental letterpress, concerning the character of which the less said the better. Prof. Ganong combines in a particularly happy manner scientific accuracy, clearness of exposition, and literary style, such as make this book delightful reading, whether he is dealing with the deeper problems of physiology or with the most familiar aspects of plant life. The work is marked throughout by freshness and originality of treatment, and the diagrams and generalised drawings which he gives so freely will be of the greatest value to teachers of botany, apart from their primary object of enabling the "general reader" to understand the descriptions which they illustrate.

(3) Mr. Bastin has produced a thoroughly attractive and interesting work, well designed to serve as a first introduction to the study of the flowerless plants, with the aid of the more detailed books on the various groups. Unlike some other writers of popular nature-study books, the author aims solely at arousing the reader's interest by means of excellent photographic illustrations and simple but, so far as they go, accurate descriptions, and takes care to point out that the reader of books of this scope will find in the text-books of the specialist "the best possible friends, incomplete in themselves, but priceless as guides to those things which alone can be truly studied in the open air." Nothing could be more different from the explicit or implicit claims of various other "popular" botanical writers to have presented a full and sufficient treatment of the subject in their books. Mr. Bastin's work is admirably calculated to stimulate interest in the hitherto somewhat neglected groups—from the nature-study point of view—with which he deals, and the reader who wishes to proceed to a more detailed study will, at any rate, have nothing to unlearn, though one rather wishes that the author had included in his excellent work a list of suitable books for the further study to which this forms such an admirable introduction.

(4) Mr. Meier's book, though written primarily for American use, contains scarcely anything that will not be found of interest and value to teachers of school-gardening in this country, as well as to amateur gardeners in general, and this despite the fact that the author does not deal with generalities or with experiments. He has succeeded admirably in his attempt to give definite instructions for the arrangement, planting, and care of a fairly wide range of plants commonly grown in the house and garden, the difficulties met in cultivating each individual plant being considered one at a time, and definite directions given for overcoming them.

(5) The second half of Mr. Clute's book covers much the same ground as the work just noticed, but its scope is somewhat wider, and the first portion constitutes an excellent general introduction to botany. Many of the illustrations of familiar objects have a fresh appearance, owing to the author's very sparing use of figures copied from other works. Nothing could be more suitable as a general introduction to botany and horticulture than the lessons on soil with which the book opens, though this portion might perhaps with advantage have been expanded. The teacher will find much that is useful in the work, despite the fact that American examples and illustrations are largely used.

(6) The late Prof. Strasburger's well-known "Botanische Praktikum" needs no special recommendation to teachers and students of botany, to whom it is well-nigh indispensable, no other single book covering so much ground. In successive editions the book has grown in size until in the present one, the fifth, it has become perhaps unduly large for convenience in laboratory use.

The present edition differs from its predecessors mainly in the addition of a considerable amount of new letterpress and illustrations dealing with micro-technique, the general plan of the work remaining unaltered. It is an open question whether there is not rather too much general descriptive matter that would be more in place in a book intended for the study instead of the laboratory; but still, the tacking-on of more or less theoretical passages to the directions for practical work has decided advantages. The chief drawback to the plan is that it is somewhat difficult to know where the line should be drawn, and that a book of this kind tends to indefinite expansion in successive editions; this objection is to some extent met by the author's smaller book, the "Kleine botanische Praktikum," but since the student can obtain the necessary theoretical matter in the ordinary descriptive text-books, it would appear better to limit the scope of a practical manual to directions for actual laboratory work. The use of the copious index relating to technique is facilitated by its being printed on coloured paper in this edition, which will be welcomed by teachers and students of botanical microscopy as the best and most comprehensive treatise on the subject in existence.

(7) This little book opens up what is to a large extent a new field, and will be of the utmost value to students of geology and plant ecology, as well as palæobotany. Despite its small size it contains an immense amount of skilfully condensed information, and is mainly occupied by concise and clear directions for the examination of fossil and subfossil plant remains in coal, peat, clay, &c. The names of Prof. Potonié and Dr. Gothan are sufficient guarantee of the excellence of the major part of the work, which is concerned with the preparation and examination of fossil and subfossil plant remains generally, but special attention may be directed to the excellent section by Dr. Stoller dealing with the investigation of peat deposits from the ecological and phytogeographical point of view.

(8) The labour undertaken by Dr. Jongmans in compiling an annual bibliography of palæobotanical literature has evidently secured the approval and support which it deserved, though one may regret the delay in issuing the third volume of this work, containing the titles for the years 1910 and 1911, with a supplementary list of 1909 publications. The mere citation of titles, however, forms a small part of the work, occupying only forty pages of this volume; the remainder (more than 500 pages) is devoted to the indexing of the plants dealt with in some 800 books and papers, a few words being added in each case to indicate the general nature of the communication made concerning the plant named.

(9) The original plan of the "Icones Plantarum Formosanarum" was to publish in a long series of fascicles, extending over some fifteen years, a flora which should contain full descriptions of all plants found in Formosa. However, even in the first fascicle (1911) this plan had to be altered slightly so as not to exceed the grant made by the authorities, and accordingly only the new species were described, with notes on the others; and in the meantime a further reduction of the grant has unfortunately compelled Dr. Hayata to cut out nearly all references to species in this second fascicle. Even in this somewhat truncated form, the work is of the utmost value; the present instalment contains keys to the families, genera, and species, an enumeration of Formosan plants from Saxifragaceæ to Dipsaceæ, with their localities and geographical distribution, descriptions of new plants, and forty very fine plates. The total number of flowering plant species now known from Formosa is a little more than 3000. For the interesting conifer *Taiwania cryptomerioides* a diagnosis is given of the male flowers, which were first discovered in 1911; in its male flowers this genus shows marked general resemblance to Cunninghamia.

F. CAVERS.

## OUR BOOKSHELF.

*Einführung in die Spektrochemie.* By Prof. G. Urbain. Uebersetzt von Dr. U. Meyer. Pp. viii+213+9 plates. (Dresden and Leipzig: Theodor Steinkopff, 1913.) Price 9 marks.

THIS book is a translation of the French edition which has already been reviewed in these columns. It is based on a course of spectroscopy given by the author at the Sorbonne, and will be found useful in this country to colleges taking a short course in the subject for advanced students.

The book contains an excellent and up-to-date account of the various methods used in the production of spectra. The descriptions of the methods employed are very clear and well illustrated with diagrams, and contain many laboratory details necessary to know in order to repeat the methods with facility, but which are generally omitted from text-books.

Following this, which occupies nearly half the book, are chapters on phosphorescence and absorption spectra. A final chapter is devoted to the analysis of spectra into series and the laws of series, in which the chief facts of the subject are clearly set forth.

*A Galla-English, English-Galla Dictionary.* Collected and Compiled by E. C. Foot. (Cambridge University Press, 1913.) Price 6*s*. net.

THE Galla are people living in Abyssinia from Harrar, on the east, to the Sudan frontier on the west, and from Wollo, in the north, down to the southern frontier. Some, too, live in British East Africa, and a detached tribe to the west of Witu, on the north bank of the Tana river. Mr. Foot describes them as "a most industrious, pastoral and agricultural people, who are also keen traders."

Mr. Foot has been studying their language since he went to Abyssinia first, in 1907, and the volume gives the results of his industry. As Sir John Harrington says in his introductory note, the dictionary should be of service not only in Abyssinia, but also on her frontiers with the Sudan, Uganda, and East Africa.